

Application No. 09/681,304

RD-28435

REMARKS

This case has been carefully reviewed in light of the Office Action dated 26 August 2002, wherein claims 1-4, 6 and 16 were rejected under 35 USC 103(a) on Gorowitz et al., US Patent No. 5,757,072 (hereinafter Gorowitz) in view of Noddin, US Patent No. 5,731,047; and claims 7-8 and 19 were rejected under 35 USC 103(a) on Gorowitz and Noddin and further in view of Saia et al., US Patent No. 6,150,719 (hereinafter Saia). Claims 4 and 6 have been amended. Claims 1-4, 6-8, 16, and 19 remain pending in this application. Reconsideration in light of the above amendments and the following remarks is respectfully requested.

Claims 1-4, 6 and 16

When constructing a clean version of the claims, Applicants noted that claims 4 and 6 depend from a canceled claim. Applicants apologize for this oversight in responding to the last Office Action and have amended these claims to correct the dependency in response to the present Office Action.

Applicants respectfully traverse the rejection of claims 1-4, 6 and 16 under 35 USC 103(a) over Gorowitz in view of Noddin. Applicants respectfully submit that the applied references do not teach, suggest, or disclose (either individually or in combination) the claim 1 and 16 recitations of:

1 (amended). A method for packaging a microelectromechanical system (MEMS) device comprising:
using a partially-cured adhesive to attach a release sheet to a MEMS package flexible layer;
providing a cavity having a smooth surface perimeter and extending through the release sheet and at least partially through the MEMS package flexible layer;
removing the release sheet; and
attaching the MEMS device to the MEMS package flexible layer with a MEMS structure of the MEMS device being positioned within the cavity.

16 (amended). A method for packaging a microelectromechanical system (MEMS) device comprising:
coating an MEMS package flexible layer with an adhesive;
partially curing the adhesive;
using the adhesive to attach a release sheet to the MEMS package flexible layer;
providing a cavity having a smooth surface perimeter and extending through the release sheet, the adhesive, and at least partially through the MEMS package flexible layer;
removing the release sheet;
using the adhesive to attach the MEMS device to the MEMS package flexible layer with a MEMS structure of the MEMS device being positioned within the cavity;
providing MEMS vias through the MEMS package flexible layer extending to connection pads of the MEMS device; and
applying a MEMS pattern of electrical conductors on the MEMS package flexible layer and extending through the MEMS vias to the connection pads.

Applicants respectfully traverse the Office Action statement on page 2, section 2, paragraph 4 alleging that Gorowitz discloses "providing a cavity 16r having a smooth surface perimeter (column 6, lines 65-66). Applicants likewise traverse the Office Action statement on page 4, Response to Arguments, paragraph 3 alleging "Gorowitz et al. disclose the cavity 16r is a 'U shaped' (fig. 2, column 6, lines 65-66). Therefore, Gorowitz et al. disclose the cavity has a smooth surface perimeter."

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As stated in paragraph 16, lines 3-11, of Applicants' Specification:

"Smooth-surfaced perimeter" is meant to encompass any perimeter without sharp edges (such as 90 degree corners in square or rectangular perimeters). Examples of smooth-surfaced perimeters include ovals, circles, rounded rectangles as shown in FIG. 3, or other straight line perimeters having rounded corners or corners of greater than 120 degrees, for example. Smooth-surfaced perimeters are useful for evenly distributing any excess adhesive that is close to the surface of MEMS structure 22. Harsh-surfaced perimeters such as 90 degree corners create the potential for localized stress and excess flow of adhesive (and thus the potential for interference with MEMS structure 22).

In the context of FIGs. 1 and 2, Gorowitz column 6, lines 60-66 recite:

Protective cap 16 is a protective "shield" structure comprising a cover-portion 16t having a top surface 16e and a bottom surface 16d, and a peripheral leg-portion 16l extending from the cover-portion bottom surface 16d to component surface 12b. Cover-portion 16t and leg-portion 16l cooperate to define a "U shaped" recess 16r.

The "U shape" is not described in a manner that relates to the perimeter as described in Applicants' Specification and shown in FIG. 3. Instead the "U shape" appears to relate to the walls (defined by surface 16b of leg-portion 16l) and roof (defined by surface 16a of cover-portion 16t) of the protective cap.

Noddin does not overcome the above absence of the teaching, suggestion, or disclosure of a smooth surface perimeter in Gorowitz.

Accordingly, Applicants respectfully submit that claim 1, claims 2-4 and 6 which depend therefrom, and claim 16 define allowable subject matter over the applied art.

Claims 7-8 and 19

Applicants respectfully traverse the rejection of claims 7-8 and 19 under 35 USC 103(a) over Gorowitz and Noddin and further in view of Saia.

Claim 19 depends from above-discussed claim 16.

Applicants respectfully submit that the applied references do not teach, suggest, or disclose (either individually or in combination) the claim 7 and 19 recitations of:

7 (amended). A method for packaging a microelectromechanical system (MEMS) device comprising:
using a partially-cured adhesive to attach a release sheet to a MEMS package flexible layer;
providing a cavity extending through the release sheet and partially through the MEMS package flexible layer;
providing a protective coating in the cavity;
then removing the release sheet; and
attaching the MEMS device to the MEMS package flexible layer with a MEMS structure of the MEMS device being positioned within the cavity.

19. The method of claim 16 wherein providing the cavity comprises providing a cavity extending partially through the MEMS package flexible layer and further comprising, prior to removing the release sheet, providing a hermetic coating in the cavity.

Applicants continue to respectfully traverse the Office Action statement on pages 4 and 5 that "it would have been obvious ... to modify the device of Gorowitz et al. with a protective coating for the

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polymer film, as shown by Saia et al." Applicants note that there appears to be a typing error in the Office Action on page 5, the second full paragraph which should start with "Saia discloses ..." rather than be interpretable as a continuation of the discussion of Gorowitz in the first full paragraph.

The Office Action basically states that (1) Gorowitz and Noddin do not disclose providing a protective coating in the cavity; (2) Saia describes a DLC film forming a hermetic seal over a polymer film structure to protect the polymer film; and (3) it would have been obvious to provide the protective coating in the cavity. For support of point 3, the Office Action further refers to an antireflective coating of a non-relied upon reference (Hays et al., US Patent No. 6,252,229) as showing a reflective coating in a cavity. Hays appears to relate to pressure seals between two semiconductor type substrates enclosing a structure such as a microbolometer (array of small radiation detectors). The anti-reflective coating appears to be suggested for "permit[ting] transmission of the radiation to be detected" (see column 7, lines 22-27). There is no mention in Hays of a protective coating, and Applicants fail to see how Hays is pertinent.

More specifically, however, Applicants fail to understand how point 3 follows from points 1 and 2. In Saia, the coating is an **external** (on an outer polymer surface) coating over a polymer film structure to protect underlying metallization (Saia, column 4, lines 30-40). The motivation to apply this description to an **internal** (on an inner surface facing a chip) coating is not clear to the Applicants.

Furthermore, the specific motivation for applying the coating **prior** to removing the release sheet is not shown in the Office Action. As described in paragraphs 17-18 of the Specification, this ordering is useful for permitting blanket application of the protective coating which will then only remain in the cavities after removal of the release layer. This feature would be difficult to realize with the Gorowitz embodiment. Page 3 of the Office Action characterizes element 32 as a Kapton polyimide film in an attempt to fit it into Applicants' characterization of a "release sheet." Gorowitz however, calls element 32 a "hard mask layer" (column 9, line 3) with examples being metals which typically require etching for removal (see column 9, lines 5-15).

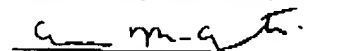
Accordingly, Applicants respectfully submit that claim 7, claim 8 which depends therefrom, and claim 19 define allowable subject matter over the applied art.

Summary

In view of the foregoing, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number below.

Respectfully submitted,



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Version with markings to show changes made

Replacement Title: Microelectromechanical System Device [Package and] Packaging Method

Claim 4 (amended two times). The method of claim [9] 1, wherein attaching the MEMS device comprises using the adhesive.

Claim 6 (amended two times). The method of claim [9] 1, wherein the adhesive comprises a mixture of photodielectric and epoxy materials.